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Autologous chondrocyte implantation in patients 45 years and older

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Purpose: ACI has proven to be a successful and durable treatment option for full thickness chondral defects of the knee. The purpose of the present study was to determine whether increasing patient age adversely affects clinical outcome as many patients > 45 years old wish to remain active and preserve their joint.
Methods and Materials: This prospective study reviews patients treated > 45 years having ACI involving the weightbearing condyles, patella, trochlea in isolation or in combination. The clinical evaluation included five validated rating scales ; Short Form-36, Modified Cincinnati Rating Scale, WOMAC Index, and a Visual Analogue Scale. Age, gender, defect size, and additional procedures were recorded. The cohort was then subclassified into Simple, Complex and Salvage categories.
Results: The average patient age at index surgery (ACI procedure) was 48.7 years [range, 45-60 years]). The minimum follow up was 2 yrs. to 10yrs, average of 6 years .There were fifty-five patients with 116 defects treated with ACI between February 1995 and February 2005. The patients' cohort included 36 males and 19 females. The defects were 4.7 cm2/defect, 9.9 cm2 /knee (range, 2.5cm² - 31.6cm²) per knee. There were 7 failures of the 55 patients (12.7%). At their latest available followup >75% patients would choose ACI as the surgical option to treat their symptomatic cartilage defects.
Conclusions: Our results suggest that ACI is a reliable method in treatment of symptomatic full-thickness articular chondral defects anywhere in the knee in patients 45 years and older.

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Friction and wear testing of articular cartilage in a unicondylar knee hemiarthroplasty using a pendulum friction simulator

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Purpose: There is growing interest in hemiarthroplasty, biomaterial and tissue engineering defect repair for early intervention treatment of osteoarthritis in the knee. However, the clinical use of these approaches has not been supported by preclinical in vitro testing. Previous frictional studies of articular cartilage(AC) have mainly focused on simple pin-on-plate geometries. The aim of this study was to develop a tribological simulation of the medial compartment of the natural knee, to measure the friction and wear of AC against itself and against biomaterials suitable for cartilage surface replacement.
Methods and Materials: Saggital sections from bovine medial femoral condyles were articulated against a (a) natural tibial surface and (b) flat 316L stainless steel counterface (model for a worst case hemiarthroplasty). Physiological loading profiles representing low and high stress conditions were applied using a pendulum simulator(Simsol,UK). Peak loads were varied from 260N-1.5kN representing the maximum load in the medial compartment with and without the meniscus, respectively.
Results: Condyles articulating against the cartilage tibial surface (for 3600cycles) produced low levels of friction(average m=0.04) and no wear was observed under low load conditions. The condyles articulating against the metallic counterface (for 3600cycles) showed higher friction(average m=0.078), with evidence of AC deformation and wear. Surface roughness increased significantly from 0.7mm-2.7mm. With elevated loading against the metallic counterface the wear of the AC was through to the bone and hugely accelerated (300cycles). Friction was higher(average m=0.13).
Conclusions: This model provides a better understanding of AC friction and wear in a hemiarthroplasty and particularly highlights material and stress as extremely important variables.

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Improvement in symptoms and function after autologous chondrocyte implantation (ACI,Carticel) in patients who failed prior treatment. Results of the study of treatment of articular repair (STAR) trial.

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Purpose: To assess the efficacy of ACI in patients who, within the prior three years, had failed other surgical treatments for cartilage defects of the femur.
Methods and Materials: A prospective multi-center study of ACI performed in patients who failed index treatment for articular cartilage defects including microfracture, OATS, or debridement. Primary endpoint was assessment of survivorship of Carticel and non-Carticel treatments. Secondary endpoints included KOOS, modified scales of Cincinnati Knee rating system, VAS, and SF-36. Serious adverse events including subsequent surgical procedures (SSP) were recorded. A sample size of 100 provided 90% power at α=0.05.
Results: 154 patients received ACI following failure of an index treatment. 126 (82%) completed 4-year follow-up. Median age: 35, median lesion size: 4.0cm². Lesion location: 66% MFC, 17% LFC, 17% trochlea, 50 (32%) had multiple lesions. 76% (117/154) had improvement at 4 years; the median difference in treatment survivorship was 31.68 months. Mean improvements in all outcome scores were observed from baseline to all follow-up time points ($p<0.001$). Pre-op to post-op (48 month) values, respectively, are KOOS Pain: 48.7 to 72.2; KOOS Sports/Recreation: 25.8 to 55.8; KOOS Knee Quality: 20.9 to 52.2; KOOS ADL: 58.6 to 81.0; modified Cincinnati overall knee condition: 3.26 to 6.31; VAS: 28.8 to 69.9 and SF-36 Overall Health: 33 to 44.4. 40% (61/154) had an ACI-related SSP. The most common arthroscopic findings were hypertrophy and fibrosis.
Conclusions: In patients who failed prior cartilage repair procedures and who have large symptomatic chondral lesions with significant impairment, ACI provided sustained (4 year minimum) clinically meaningful improvement.